General Assembly of the International Association for Prevention of Blindness

LONDON, APRIL 5, 1935

THE INTERNATIONAL ASSOCIATION
FOR PREVENTION OF BLINDNESS
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In the unavoidable absence of Professor de Lapersonne, Dr. Park Lewis, vice president of the Association, occupied the chair and expressed to the Assembly the regrets of the president of the Association. Dr. Lewis read the president's message.

President's Message

Today we are the guests of the Royal Society of Medicine of London, which always takes an active interest in all movements connected with the progress of medicine, public health and the prevention of disease. We express to Mr. Robert Hutchinson, its president, and the members of the Royal Society our deep gratitude. We address special thanks to President Ramson Pickard and the members of the Ophthalmological Section.

We have received an equally cordial welcome from our colleagues and friends of long standing of the Ophthalmological Society of the United Kingdom; we have been happy to take part in their annual Congress.

We have been greatly honored by the splendid reception of the Clothworkers' Company. This corporation, which upholds the City's most noble traditions, has given a new proof of its interest in all subjects connected with human welfare; I beg to express to the Clothworkers' Company our most sincere thanks.

Finally, to close these meetings, we shall have the honor of attending tonight an official reception given by His Majesty's Government at Lancaster House.

The International Association for Prevention of Blindness feels deeply these public expressions of interest, as well as the cordiality of private receptions.

We are happy to note that since our last meeting our Association has made further progress. Its financial resources are increasing, thanks to the generosity of our faithful subscribers. The subsidy of the French Ministry of Health was raised last year to 25,000 francs. Further, I beg to express our gratitude to our generous benefactors, founders, and subscribing members, whose numbers are increasing. Contributions towards our budget have come from the National Committees of Belgium, Bulgaria, Great Britain, Greece, Hungary, Italy, the Netherlands, Poland, Spain, Switzerland and Syria. We express to them our most sincere thanks while we draw again the attention of all national committees to the importance of sending us regularly the modest contribution of 500 francs recommended at the Madrid Congress.

Finally, I make special mention of the National Society for Prevention of Blindness in the United States, for its unfailing co-operation, both in money and in effort.

The programs carried out by some of these national committees have been remarkable. For instance, in Canada, the Industrial Prevention Association, Toronto, and the Province of Quebec Safety League, have both sent us very fine series of posters. In Brazil, the first Ophthalmological Congress has been entirely devoted to prevention of blindness organization; efforts were made to create regional committees in each province, to be supported by government subsidies. In India, under the direction of the Red Cross, new dispensaries have been created and popular pamphlets have been distributed in districts where the proportion of blind persons is high.

Among new regional centers, we are happy to record the creation of the Algerian Association for Prevention of Blindness. With the Governor General of Algeria as honorary chairman and under the direction of Professor Toulant, this association will set up new dispensaries for the treatment of eye disease among natives. The organization is the result of the remarkable "Instructions on the Organization of the Campaign against Trachoma in Algeria" which was submitted to you last year by General Medical Inspector Lasnet.

The Executive Committee held its statutory meeting this morning. We bowed respectfully before the memory of the Honorable John Barton Payne, chairman of the American Red Cross, who was a member of our Honorary Committee; of Dr. Villarreal, of the Mexican Red Cross, a member of our Executive Committee; and especially of the late Dr. Cridland, our excellent friend and colleague who represented Great Britain among us. I feel sure I am your interpreter in expressing our deep regret at these losses.

After the financial accounts had been approved the Committee resolved to reappoint its staff, with exception of the secretary-general. Dr. Humbert, whose time is absorbed by his new post, has been obliged to maintain the resignation he had sent us last year. We express to him our regret as well as our most sincere gratitude for his services to our cause. To replace him we proposed the name of Professor van Duyse, a member of the Executive Committee, who is wholly devoted to our work and with whose scientific standing and practical and efficient mind you are well acquainted. It is with entire confidence that we suggest his name.

With regard to the Executive Committee we beg you to approve the nomination of Professor Nordensen, of Stockholm, the president-elect of the next International Ophthalmological Congress; of Professor Britto, of São Paulo, who will represent Brazil. To replace the late Dr. Cridland, as Great Britain's representative, we have approached Dr. MacCallan, who has very kindly placed himself at the disposal of the Association.

Finally, we request you to designate as a member of your Executive Committee, Dr. Maziny Bey (Egypt) who officially represents the Egyptian Government at this meeting.

We close here this brief account of the work of our Association, and shall call upon Professor van Duyse and Professor Franceschetti to read their learned and painstaking reports, which you have received in advance. Their topics are of utmost importance: the classification of the causes of blindness—a question which has been studied during the last two years by a special Commission; and hereditary diseases of the eye resulting in blindness—their social consequences and the measures that may be proposed.

The Classification of the Causes of Blindness *

Professor van Duyse (Ghent)

Before submitting to you the report on the classification of the causes of blindness with which you kindly entrusted me, I wish to express my appreciation of the work of my distinguished colleagues who, before me, have investigated this problem on behalf of the International Association for Prevention of Blindness: Drs. Bishop Harman, Park Lewis, Lewis H. Carris, Marx, Maziny Bey, Professor Marquez and Professor Zeeman. Their conclusions, which I have used as a guide, have made my task much easier.

I hasten to say that I have not solved the problem. I have been content with drawing your attention to a few important points. If we can come to an agreement on these points I feel convinced that we shall be much nearer the solution we are looking for.

I. To be able to compare the statistics drawn up in the various countries and to deduce useful conclusions from them, it is important that they should be based on uniform data.

A classification ought to include:

1. The totally blind (persons unable to perceive light).
2. The partially or socially blind (persons whose visual power is so reduced that they cannot perform any work for which eyesight is essential).

One should come to an agreement with regard to the socially blind. We propose to complete Trousseau's definition and to consider as such: any person who is unable to count fingers against an obscure background, at a distance of one meter, under good lighting conditions, after eventual correction for ametropia, and whose condition cannot be improved.

The following ought to come under the same heading:

(a) Persons whose visual fields are seriously altered:
    Concentric narrowing at 5°;
    disseminated scotomas;
    abolition of the visual fields with the exception of a strip or a peripheral section;

(b) Persons with hesperanopia having, moreover, a narrowing of the visual fields;

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(c) Persons with permanent blepharospasm;

(d) Persons with permanent and incorrigible diplopia.

3. Curable cases and the blind in one eye would not be included.

4. Only the final cause of blindness is mentioned (if primary and secondary causes leading to blindness were recorded, the registration forms would be too complicated) (Bishop Harman).

5. The examination of the blind or nearly blind, in order to draw up statistics, should be exclusively entrusted to one or several oculists, as the determination of the cause of the loss of one eye may give rise to serious difficulties (when one must, for instance, determine, after the event, the cause of an optic nerve atrophy).

6. The age of the individual must be taken into account.

For hereditary diseases, for instance, the number of blind at birth is 3.43 per cent, while in statistics of the blind of all ages, these diseases account for a rate of approximately 25 per cent.

It is most important to register the causes of blindness in the early years of life as the chances of becoming blind are at their highest between 1 and 10 years. This fact must be given due consideration with regard to prevention.

Conclusion: a classification must include the blind of all ages.

7. A fact not devoid of interest is the sex of registered cases of blindness; from the statistics it appears that two-thirds of the blind are males.

II. Should a detailed or a short classification be adopted?

Bishop Harman believes that an extensive classification would entail an exaggerated complication of the registration forms and would be less likely to be adopted for general use. This opinion is shared by El Maziny Bey, judging by his criticisms of the classification proposed by Marquez and Marx.

Other authors, among them, Ballantyne, are of opinion that a detailed classification allows a better presentation of the facts related to the causes of blindness from childhood to old age.

This remark is not unfounded; Schaidler's statistics show that for 10,000 inhabitants in Bavaria the number of blind is 2.88 per cent under 50, while after that age this rate goes up to 20.3 per cent. The value of the arguments put forward by the supporters and the adversaries of the detailed classification cannot be denied. This is the reason why we propose that the two classifications be adopted.

The briefer classification, simpler, clearer, and more adaptable, would be used to draw the attention of the authorities to the economic losses resulting from blindness, to point out the factors which are responsible for the risk of blindness and the methods susceptible of reducing such risks, therefore of preventing blindness (social classification). For instance, in order to demonstrate the usefulness of public health measures it will be sufficient to compare statistics based merely on a few diseases, drawn up in two provinces: Bosnia (where public health principles are not strictly applied) and Lower Austria (where these principles are more carefully observed).

Of 100 blind persons

	in Bosnia	in Lower Austria
Congenital anomalies	1.5	1.5
Retinitis pigmentosa	3	1.8
Blennorrhagia	30	6
Smallpox	30	0.5
Measles	1	1
Scarlet fever	1	1
Scrofula	6	0.5
Diphtheria	0.5	0.5
	73	12.8

A detailed classification (scientific classification) alone is sufficiently accurate to be used for scientific purposes.

III. The classification of the causes of blindness may be based on:

(a) pathological anatomy;

(b) topography;

(c) etiology.

The brief classification proposed by Bishop Harman and based on pathological anatomy, might, in our opinion, be adopted without changes.

As for the detailed classification, it might be based simultaneously on etiology and topography.

We did not think it necessary to establish a marked distinction between these two modes of classification: by gathering together all the data in the same table, the reader's task is made easier.

The topography (affected part of the eye) may be indicated either by a figure (for instance, 1. globe; 2. conjunctiva; 3. cornea, etc. . .) or by a letter (Dr. Marx's suggestion).

We hope that a classification will soon be drawn up and adopted everywhere. This would greatly help us to form an accurate conception of the causes of blindness, the cases in which it might have been avoided, and efficient preventive measures. This classification would lead to appreciable results in the social and humanitarian field.

Discussion

Mr. LESLIE PATON (Great Britain).—We have to remember that the classification of blindness has a double function—there is what we may call the scientific classification of blindness, which requires a very elaborate schedule, and that elaborate schedule, from the scientific point of view, is extraordinarily valuable; but there is also the classification of blindness from the social and economic standpoint, and that classification ought to be very much simpler, shorter and more easily comprehensible by lay bodies. I am afraid that so far these two aspects have become more or less confused.

The English Prevention of Blindness Committee, which is financed by the Clothworkers' Company and by the Union of Counties Association for the Blind, has already secured the return of something like 9,000 complete schedules from registered blind, of whom there are about 66,000. Mr. Cardell and I have roughly classified about 3,000 of those 9,000 forms. There are certain very definite things revealed. What the English Committee for the Prevention of Blindness wants to know is what blindness, social and economic, can we prevent, and one or two things particularly—I am not going to refer to them all; it would take most of the afternoon—have emerged from the investigation of this preliminary classification of 3,000. Ophthalmia neonatorum occurring at the beginning of life causes blindness throughout life. There are other causes, like glaucoma and cataract, but undoubtedly from the small number of schedules that we have already examined the results suggest that by the adoption of proper preventive measures, prenatal and postnatal, a great many cases of ophthalmia neonatorum could be avoided. The prevention of ophthalmia neonatorum is going to make a very big difference to the number of blind in this country.

I only wanted an opportunity of bringing before the company the fact that we have got fairly well on in the way of a preliminary report, and I hope before many more months are over that report will be available.

Dr. A. F. MacCALLAN (Great Britain).—It is understood that what is being considered is a scientific classification for the use of ophthalmic surgeons, and not a scheme for the registration of those who have so little visual acuity as to need, if children, a special form of education, or, if adults, financial assistance to enable them to earn a living or to enable them to exist without misery. It is therefore necessary to include in the classification, cases of monocular blindness, for if this is not done the ocular disasters which may result from war, from following certain trades, from engaging in certain sports and from birth injuries will be omitted. This was referred to in the interesting scheme of classification which was drawn up by Professor Marquez and presented to the XIV International Congress of Ophthalmology.

In a country where there has been for many years a well-understood definition of blindness and scheme of classification it is undesirable that these should be changed. I instance Egypt, where a quarter of a century ago I adopted Trousseau's definition—"inability to count fingers at a distance of one meter." The scheme of classification which I arranged is shown, as well as the statistics for the years 1908 and 1932. These refer to patients who were blind in either one or both eyes.

It is seen from these statistics that the incidence in blindness in one or both eyes among patients presenting themselves for treatment at the ophthalmic hospitals of Egypt has been reduced in a period of 25 years from approximately 13 per cent to approximately 7 per cent.

If I were arranging a system of classification for Egypt at the present time I should make some changes in the schedule; nevertheless, I consider that there is a great advantage in retaining a classification by which the amount of blindness in the country can be gauged from year to year, and which is not too complicated for compilation by the medical officers.

Three different systems of classifications of the causes of blindness have been brought to my notice, and there may be others with which I am unacquainted. These are: (1) that of Professor van Duyse;

(2) that of Professor Marquez; and (3) that contained in the Report of the Prevention of Blindness Committee, London, 1931.

I am sure we are all greatly indebted to Professor van Duyse for the trouble he has taken and for the high scientific ability he has shown in the scheme of classification he has proposed. I think for a detailed scheme it would be difficult to arrange anything more all-embracing. However, I do not think that hospital medical officers would have the time or patience to carry it out.

The scheme proposed by Professor Marquez seems to be highly original and useful. As regards inscription, it can be carried out quite well by an ophthalmic surgeon; but in the preparation of statistics at the end of a year the services of highly expert persons would be required.

I must give my opinion that up to the present the classification of blindness already adopted by the Prevention of Blindness Committee in London is the most useful, for my own country at any rate.

Dr. J. M. BICKERTON (Great Britain).—I hesitate to come forward on the question of the registration and certification of the blind but there are one or two points which I think in England are not sufficiently understood and they are necessarily preliminary to long-range methods of blindness prevention. The first is a more complete blind register. The second is the payment of a fee for proper certification. The first of these conditions cannot be obtained without the second, unless compulsory notification be resorted to. In Great Britain today there are several points in connection with blindness prevention which could be much improved to the benefit of all concerned. The tendency is for the destitute blind only to be registered. A full register of all classes of the community is very important, because the causes of blindness of the poorest sections may be different from those of the less poor groups. If, and as, the poor decrease in number we will be faced with, perhaps, different causes of blindness for the general population.

If the excellent arrangements which are in operation in some areas were put into force, the whole blind population would come under close review. This consists in paying the doctors to register the blind that they see. Lieutenant-Colonel Wright, in his recent important paper on the "Chief Preventable Blinding Diseases of Childhood in India," states that hereditary diseases as a whole may be more important than any other causes. He also points out that the care of the blind is a more popular social virtue than to prevent blindness, and he says to his hearers: "None are so blind as those who will not hear." The new form of the registration of the blind in England is excellent, but unpopular, because those signing these certificates often have not been informed of the use to which the form is to be put.

Mr. S. R. LOVETT (Great Britain).—I am a member of the staff of the Ministry of Health and we are interested in this question from an administrative point of view. We are bound by law to decide in a number of cases whether or not a person is blind, such as in appeals by persons who have been refused blind old-age pensions. That necessitates a definition of blindness, and with the aid of the advice of the Prevention Committee we have issued a circular which gives that definition. The law says that any person who is too blind to perform work for which eyesight is required comes under that definition, but we found in practice that it had to be converted into an ophthalmological interpretation and it was on that question that we sought and obtained the advice of the Prevention Committee.

With regard to Mr. Paton's contribution, I regard the difficulty of filling in the form as one of its greatest virtues, because an ordinary general practitioner without special knowledge of ophthalmology finds it extremely difficult, and by requiring the use of the form, the Minister of Health has tended to ensure that it shall be filled in by a skilled ophthalmologist. While that is not so throughout the country today, we hope that the time will come when it will be a universal practice.

While there are exceptions, I think that throughout the country there are more authorities now paying an agreed fee to the ophthalmologist than there were a few weeks ago. I very much doubt, from my experience of the work, whether a very large number of blind persons, children or adults, are escaping certification. You have to remember that not only are the doctors watching all the time but there is in this country a very elaborate organization for the welfare of the blind, such as home teachers, who are constantly going in and out of the homes of the people and reporting cases as they find them. Sir Ian Fraser has attempted to introduce a scheme under which all blind persons should be visited by a skilled ophthalmologist without charge. Even wealthy people are not above taking advantage of that service and one might expect a large increase in blindness notifications and classifications in certain sections of the population as a result of that.

Mr. LEWIS H. CARRIS (United States).—For the past five years we have had in the United States a Committee on Statistics of the Blind, which is responsible for the development of standard classifications and procedures to be applied to the collection of statistics on blindness. One of its first projects was the development of a classification of causes of blindness. Our Committee was interested primarily in obtaining cause of blindness data which would be useful in the prevention program. Hence we were inclined to emphasize the etiological facts. However, after consideration it was decided that, since no diagnosis is to be considered complete unless it included information concerning both the nature and location of the eye lesion responsible for blindness and the etiological factor causing the eye condition, our classification should be a double classification—by topography and etiology. During the past year the Committee's two-fold scheme of classification has been applied to the study of causes of blindness among children. Records of ophthalmological examinations of 2,702 children enrolled in schools and classes for the blind in the United States were secured for study by the Committee. At our annual conference in December, 1934, one session was devoted to the presentation of the work of the Committee on Statistics of the Blind. As the time will not permit even a brief summary of the facts brought out at that meeting I have brought with me, for those who are interested, some copies of the proceedings of the Statistics Session of our last annual conference. Those copies, together with two or three other publications of the National Society for the Prevention of Blindness will be distributed to any of you who may wish them.

Professor MARQUEZ (Spain).—I still believe that the "vertical and horizontal" classification is the best standard and I am happy to hear my eminent colleague, Mr. MacCallan, approve my conception of the classification of blindness.

I once more insist on the advisability of adopting this standard. The number of groups may be increased in a detailed classification (for the use of ophthalmologists) or diminished in a briefer classification for the use of general practitioners or even lay persons.

Dr. M. E. ALVARO (Brazil).—Methods for classification of the causes of blindness may vary considerably and in each case they probably correspond to the object of their authors.

We have arranged a classification by placing the several causes of blindness according to their greater or lesser preventability, in a decreasing series. Thus, using the several categories of blindness as they were established by Mr. Bishop Harman and distinguishing, when necessary, certain causes referred to as a whole in these categories, we made up the following list: 1. Ophthalmia neonatorum. 2. Trachoma. 3. Iritis and iridocyclitis. 4. Keratitis parenchymatosa. 5. Keratitis superficialis. 6. Defect due to occupational accident. 7. Defect due to casual accident—bad operative results. 8. Defect due to war injuries. 9. Choroiditis and retinitis. 10. Defects of the optic nerve. 11. Conjunctivitis purulenta. 12. Myopia and its consequences. 13. Defects caused by infectious diseases. 14. Detachment of the retina. 15. Glaucoma. 16. Congenital defects. 17. Choroiditis centralis senilis. 18. Retinitis pigmentosa. 19. Inoperable cataracts. 20. Tumors and neoplasmas, intraocular. 21. Tumors and neoplasms, intracranial.

Dr. **MAZINY BEY** (Egypt).—I really have not much to say of the work we do in the matter of blindness because my teacher Mr. MacCallan spoke very fully about it, but I want to express my gratitude to the Executive Committee for having appointed me a member of the Council and my great sense of honor in being allowed to speak these few words in front of so reverend an assembly. In order to help you to realize the amount of preventive work we are doing in the ophthalmic hospitals in Egypt I should like to mention that last year we had 1,000,000 new cases in these hospitals and we have had in our out-patient departments all over the country more than 6,000,000 eye cases. You can therefore imagine the part played in our country by the prevention of blindness.

Dr. **JOHN MARSHALL** (Great Britain).—I regret that I cannot support the classification of the causes of blindness suggested by the Committee. I feel that they will fail to work easily and that they will not supply the information expected of them. They appear to me to be based on a wrong principle. In them an attempt has been made to classify two variables simultaneously. The variables in the causation of blindness are the affection of the visual apparatus causing blindness and the etiology of that affection. It is obvious that if there are ten alternatives in each group they can be classified separately in 20 groups but when combined they require 100.

The fundamental causes of blindness and the diminishing vision of one eye are:

1. Destruction or absence of eye;
2. Closure of eyelids;
3. Opacity of cornea;
4. Occlusion of pupil;
5. Opacity of lens;
6. Opacity in vitreous;
7. Defect in retina;
8. Defect in nerve;
9. Defect in perception arising in brain.

I would make the following suggestions:

(a) That if two schemes of classification are suggested, the simpler classification should be a modification of the more detailed, so that the statistics produced can be comparable.

In the "Detailed Classification" the same figures can be classified in two quite different ways.

(b) With any group of statistics on the causation of blindness, the age distribution of the patients and of the onset of blindness, as well as the sex of the patients, is essential for the interpretation of the statistics.

(c) That the Council come to some definite finding on the question of curable cases. In this country the statistics on blindness will be those obtained in the examination of applicants for Blind Pension, etc., to which curably blind are entitled. Might I suggest that the Council make a distinction between such diseases as interstitial keratitis, which recover with medical treatment, and such a disease as cataract, which requires operation? The difficulty might be surmounted by asking the question, "Can sight be restored by operation?"

Hereditary Diseases of the Eye Resulting in Blindness; Their Social Consequences; the Measures That May Be Proposed *

Professor A. Franceschetti (Geneva)

The interest in human heredity since the beginning of the century is largely the result of the rediscovery of the Mendelian laws by Correns, de Vries and Tschermark in 1900.

We now possess a long series of complete investigations of heredity in ophthalmology. However, these deal chiefly with pedigrees, as most authors have been interested mainly in the familial transmission of these affections; isolated cases of these hereditary diseases have been, until quite recently, neglected and we have no accurate knowledge of their incidence.

Nettleship was the first to publish detailed ophthalmological pedigrees; that dealing with dominant hemeralopia is, even today, the most important. It was as Nettleship's collaborator that Usher undertook the publication of a series of most interesting pedigrees which can be held as an example to most authors.

In man, as in animals, the normal characteristics depend upon a considerable number of genes (polygenetic or polyhybrid). The human race, however, is not prolific and it is almost impossible to determine the genotype of the individual.

On the other hand, it is established that the hereditary pathological conditions are generally due to the modification of a single gene, or rather, in fact, as Waardenburg has very rightly observed, to the action of several genes, one of which only is affected.

The diagnosis of the hereditary eye diseases is simple for most of the congenital conditions. The postnatal ocular defects are generally more difficult to diagnose, as the inflammatory and, especially, the senile affections may present identical clinical features.

The determination of the genotype becomes extremely difficult for those anomalies where the normal condition is subject to wide physiological variations (size of the cornea, refraction, etc. . .).

We do know, however, a considerable number of hereditary eye diseases whose mode of transmission has been established.

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The mode of transmission is of capital importance in the transmission and appearance of the ocular defect in the descendants.

With regular dominance 50 per cent of the children are affected if one of the parents is diseased.

The prognosis is more difficult to make with irregular dominance since the heterozygotes may be apparently healthy. The genotypic affection, although theoretically dominant, does not always manifest itself. The frequency with which a normal or pathological character manifests itself in heterozygous individual is denoted by the term of penetration. Unfortunately, there are no statistics in ophthalmology which shed any light on this problem.

In irregular dominance, the descendants of apparently healthy parents may be affected. The probability that a descendant of an individual, subject to a disease transmitted by irregular dominance, be also affected is equal to half the penetration in per cent.

A recessive defect generally manifests itself in one fourth of the children if the two parents are heterozygous. The children of the diseased individual are, generally, apparently healthy. This is only true of the relatively rare defects. For the more or less frequent anomalies, like high myopia, the number of heterozygous individuals in the population is considerable; thus, in practice the heterozygous offspring of a diseased individual are very likely to marry another heterozygote. If the diseased individual marries a heterozygote 50 per cent of the children will be diseased.

Even for the rare recessive hereditary defects, the prognosis must be guarded. The author has personally observed a case of a man affected with congenital buphthalmia from both sides, whose first child, a girl, also presented a bilateral buphthalmia, despite the fact that there was no consanguinity of the parents.

Consanguinity is of very great importance. For consanguineous marriages, the probability of having children with recessive ocular defects is, according to Waardenburg, 27 times as great as for non-consanguineous marriages.

These figures are so striking that one might expect every oculist to be convinced of the importance of consanguinity as a factor in the manifestation of the hereditary eye diseases. A recent paper by Barret (1927), however, reveals that even today the ophthalmologists often underestimate the factor; Barret mentions the Pharaohs who for centuries married their sisters and in whom degeneracy only manifested itself in eighteenth generation. He concludes from this that marriage between first cousins is without danger if there are no hereditary diseases in the family. It is obvious that in an absolutely healthy family consanguineous marriages may even protect against degeneracy introduced into the family by non-consanguineous marriages. The genes recessive for general or ocular defects are, however, so widespread in the population today, that consanguinity must be cnsidered dangerous.

For the sex-linked recessive diseases, the pathological gene is in the X chromosome.

For the serious sex-linked anomalies there are a certain number of exceptions, the knowledge of which is essential for the prognosis of the heredity.

We do find manifestly heterozygous women affected whose fathers are healthy, which according to the rule of sex-linked recessive hereditary diseases is impossible. A possible explanation is to admit that the recessive gene may become dominant in the carriers.

This change of dominance is principally found in the families subject to hereditary atrophy of the optic nerve and chiefly in Japan (Leber's disease).

The explanation suggested by Punnet (1933) that sex-linked recessive defects may also follow the dominant mode of transmission, if one supposes that a dominant factor in an autosome inhibits the dominance of the carrier's normal gene in the X-chromosome, seems inadmissible to the author, because it is incompatible with the laws of dominance according to which the defect is frequently transmitted from father to son; this would be impossible if Punnet's hypothesis were true. Hogben (1932) supposes the dominance of two genes for the Japanese cases of Leber's disease.

Given the fact that the carriers may occasionally be affected, the problem is to know if the dominance of the normal gene is an absolute one in heterozygotes. The horticulturists claim often to distinguish homozygous from heterozygous plants even in cases of so-called absolute recessivity. In man, Wieland (1933) and Ingeborg Schmidt (1934) have recently been able to show that the carriers of color blindness often presented slight modifications of color vision, which could not be discovered by the habitual methods. It seems indicated therefore, to examine other heterozygotes to determine if it is possible to discover, at least for certain defects, local abortive modifications or constitutional variations related to the recessive gene. The author has observed, for example, that buphthalmia occurs in small gracile subjects, and that, very often, the heterozygous parents are of a similar type. These observations are still too rare to permit definite conclusions to be drawn, but it is obvious that it would be of primordial importance to be able to recognize the heterozygous individuals with more or less certainty.

Schlossman has been able to show that hemophilia may exceptionally be transmitted by the men, and that it is probable that there are also exceptions for hereditary optic atrophy. The examples mentioned in the literature as proof of these exceptions seem unconvincing to the reporter; he thinks it may be affirmed that the men suffering from Leber's disease do not generally transmit the disease to their children.

It has long been supposed that certain hereditary diseases in men were due to the modification of two or more genes (polygeneticism).

The determination of digeneticism and above all of polygeneticism in man is always very difficult. If two dominant genes are involved, one-fourth of the children are affected, if one of the parents is heterozygous for one of these genes, and the other for the second. The proportion of diseased to sound children is therefore 1 to 3, and corresponds to that of recessive defects. If one of these diseased individuals marries, one-fourth of his children are again diseased, while for recessive defects, the children are generally untouched.

Several years ago, the author suggested that keratoconus was due to two dominant genes. Recently Hogben has been able to show that glioma of the retina was also probably due to two dominant genes. This may perhaps explain the fact that individuals suffering from glioma of the retina sometimes have diseased children, despite the fact that the marriage is rarely consanguineous. Penrose (1932) believes that digeneticism should also be considered a factor in Mongolian idiocy.

The author is convinced that it will be possible, sooner or later, to show for a number of defects whose mode of transmission now seems obscure (cranial anomalies, etc.) that polygeneticism is involved.

The author indicates that the exceptions arising in the application of the Mendelian formulae to man are the following:

1. Irregular dominance.
2. Different modes of transmission for defects with the same clinical picture.
3. Late manifestation.

For the majority of hereditary diseases of the eye the mode of transmission has been determined by the study of family trees. The single cases of disease generally hereditary have been neglected by the investigators. The appearance of single cases may result from several causes.

Single cases of recessive diseases must be rather frequent and one observes that in families with 4 children, 50 per cent of the latter are affected.

It is obvious that every dominant disease must appear in the genealogical tree as a solitary case which may manifest itself by: (1) Mutation, change of dominance and manifestation of latent genotypic alterations, the influence of exogenous factors; and (2) Mutations of spontaneous idio variations are as frequent in man as in animals.

The hereditary eye diseases are often associated with modifications of other organs, especially the brain.

Exogenous diseases very often present some analogy with the hereditary diseases. Thus, for example, toxic retrobulbar neuritis may present the same symptoms as Leber's disease. The difficulties are particularly great for the tapeto-retinal degenerations (retinitis pigmentosa, family disease of the macula, etc. . .), whose clinical picture may have many resemblances to those of inflammatory diseases, especially syphilis.

All these difficulties emphasize the necessity for studying not only the family cases, but above all the sporadic cases, and epecially the members of their families, in the bounds of possibility, as requested by Usher and Julia Bell. The study of the isolated cases will probably permit to distinguish better the sporadic hereditary diseases from those which are not. The statistics we possess today are incomplete for a number of points which it would be interesting to study. They are: the frequency of isolated cases probably hereditary, family cases and the occurrence of hereditary diseases in the population. . . .

To consider measures against hereditary blindness it is indispensable to know exactly the number of cases of the anomalies whose mode of transmission has been exposed. The available statistics are very vague on this subject. These statistics are of only relative value, principally for the following reasons:

1. They are concerned with a selected material based upon the number of patients institutionalized in homes for the blind, or seen by a physician in his practice.
2. The official statistics on blindness ordinarily make no distinction between hereditary and acquired blindness, or they are based solely upon the assertion of the patients.
3. The evaluation of the number of hereditary affections is often based upon the frequency of congenital anomalies. There is much evidence that not all hereditary diseases are congenital. The result is that the figures given for the hereditary diseases are generally too low.
4. The statistics based upon the observations of an oculist in his practice are more valuable without, however, being more exact. This is due to the fact that the differential diagnosis of hereditary from acquired disease is very often difficult to make without a general examination of the patient (Wassermann reaction, etc.), and of the other members of his family.

It is obvious that the statistics of hereditary diseases should include not only complete blindness, but incomplete blindness and amblyopia. A distinction must be drawn between complete blindness and reduced visual power which prevents a person from performing any work for which eyesight is essential.

To summarize, we may say that the conception of total and partial blindness is approximately the same in the different countries. An international agreement on this point should, however, considerably simplify the task of the statisticians.

The statistics presented to the Amsterdam Congress in 1929 include 36 countries and show that the number of blind varies considerably from one country to another.

Has the number of the blind increased or decreased within recent years?

Bickerton has published a sensational paper on this question in which he concludes that in the last twelve years the number of blind in Great Britain has increased by 35,000: from 1929 to 1930 the increase was 4,126, or 11 a day. Do the figures put forward by Bickerton really prove an increase in the number of the blind? The reporter shares the opinion of Fleischer and Waardenburg, who believe that this increase is fictitious, and is explainable by the fact that an old age pension is given to the blind after 50 years of age. They therefore have every incentive to declare themselves. This explanation is all the more probable as the number of blind is decreasing in other countries. The medical, prophylactic, and social steps taken in England are in no way inferior to those in force in other countries. There is no reason, therefore, why this country should be an exception.

The statistics ordinarily distinguish between congenital and acquired blindness.

For acquired blindness it is practically impossible to rely upon the statistics to separate the cases which are hereditary and those which are not. Recent statistics for congenital blindness give a frequency of approximately 15 per cent, but most of these statistics are based on the examination of young blind subjects.

What part is played by hereditary diseases in congenital blindness? The opinion of the different authors on this subject varies.

There are no statistics which can give us exact figures on the frequency of hereditary blindness in the total number of blind. The author agrees with Waardenburg and von Verschuer who consider 33 per cent of the cases of blindness to be hereditary, and he concludes that 15 per cent of the blind are so at birth and that 33 per cent of blindness is hereditary.

It is obvious that these estimates are only valid for those countries in which trachoma, smallpox and ophthalmia neonatorum rarely cause blindness. For the other countries allowance must be made for the infectious cases.

The statistics enable us to determine quite accurately the incidence of congenital and infantile hereditary diseases. The most frequent are: buphthalmia, congenital cataract, coloboma and microphthalmia, retinitis pigmentosa, hereditary optic atrophy.

Exact figures for the diseases resulting in blindness after childhood are very difficult to obtain. The results obtained by Waardenburg and those of the 1925-26 Official German Statistics demonstrate that myopia is the principal factor in the etiology of complete and partial hereditary blindness and that one-eighth of the cases of blindness are due to this cause. Optic atrophy comes next.

The frequency of the different hereditary diseases is not the same in all countries. Leber's disease is most frequent in England and Japan and rather rare on the Continent. Buphthalmia seems to be more frequent in Holland, Germany and Switzerland than in America. Congenital cataract is common in America, Germany, Holland and Switzerland, while in England, according to Usher, zonular cataract is commoner. These variations hold not only for different countries, but for different regions of the same country.

What are the probabilities of the descendants being affected in recessive or sporadically dominant diseases? In other words can we make a prognosis for the children of patients whose pedigree is unknown to us? The author is unfortunately obliged to declare that there are no figures which would permit one to answer this question. However, according to Lewis' statistics, a patient suffering from hereditary blindness is 60 times more likely to be the child of a blind parent, than of a normal individual. . . .

The social consequences of blindness may be considered from the point of view of the blind individual and from a general point of view.

The social position of the blind and partially blind does not depend only on their eye condition but upon a series of other factors.

The social measures in force in the different countries are obviously of capital importance for the physical and moral well-being of the blind. Under this heading must be considered not only the financial relief given to the blind in certain countries (England, Germany, etc) but, what is more important, the provisions for the education of the blind. The institutions for the blind are obviously very useful, all the more so because they train their inmates in a trade. The rational organization of the societies for the welfare of the blind favors the improvement of their social status. It is obviously necessary to make the instruction of blind children compulsory, which is not the case today in most countries. The creation of classes for the partially blind is obviously a great step forward. As the partially blind can rarely continue their studies in the ordinary higher schools (according to Sexe approximately 4.5 per cent in America) or follow a profession for which good eyesight is essential, it would be useful to add shops for trade training to these schools. To our knowledge this has only been done in America.

For the State, the problem of the blind is above all a financial one.

The rôle of eugenics is principally important in the progressive hereditary diseases. The progression of these diseases is due to the fact that the affected subjects are more prolific than normal individuals. This is particularly the case for patients suffering from mental debility. This is not the case for the blind who marry more rarely than the normal and seem to be less prolific. According to the German statistics for 1925, the number of unmarried blind between the ages of 40 and 50 is distinctly larger (5 times) than for normal individuals. In addition to this there is a high infant mortality among the subjects to certain of the hereditary eye diseases. Very often, too, these parents have no children at all. This is due to the fact that the modified genes carry lethal or sub-lethal factors.

The author agrees with Waardenburg that the eugenic measures must be considered not only from the social angle, but also from a purely humanitarian one.

To reduce the number of the blind with hereditary eye diseases, it is necessary to prevent blindness in these diseases and the transmission of the diseases.

As the hereditary diseases are ordinarily refractory to all medical treatment, it may appear useless to attempt to prevent blindness in hereditary eye diseases. This nihilism is erroneous. There are a number of hereditary eye diseases in which judicious treatment may improve the morbid condition and very often prevent blindness.

There are certainly less blind with hereditary diseases in those countries where the possibilities for appropriate medical treatment, free medical advice and hospitalization are at the disposition of the public. The number of hereditary blind may be further reduced, even in these countries, in my opinion. The social workers attached to the large ophthalmological clinics and out-patients' departments may accomplish this. The importance of the social worker has been understood in America, but continues to be underestimated in Europe. The social worker visits the diseased, impresses the necessity of submitting to medical treatment which may prevent blindness, upon them, and investigates their social status and the means of aiding them. For patients living at great distances from the oculist, this is particularly important. From the purely social standpoint, the social worker is invaluable, for he may undertake the necessary steps to institutionalize the patient, secure a training in a suitable trade for him, etc.

The addition of social workers to the staffs of the ophthalmological out-patients' department is, in the author's opinion, one of the principal steps to be taken to reduce the number of blind with hereditary diseases.

Measures to prevent the transmission of hereditary eye diseases leading to blindness must be considered on theoretical and practical grounds. It is obvious that by preventing the carriers of pathological genes from having children the number of blind with hereditary eye diseases may be reduced.

Nevertheless, even from a theoretical point of view, there are considerable difficulties. Indeed, the external manifestation of recessive genes is only present in the men subject to sex-linked recessive diseases, and in some of the heterozygous women. In digeneticism and in irregular dominance, the genotypically diseased individual is often apparently healthy.

If one wishes to prevent procreation in all the carriers of morbid genes it is necessary to include individuals who may be normal.

Another difficulty arises from the fact that the hereditary diseases often manifest themselves only after puberty. As a result, the patient may have already transmitted his affliction when the disease first manifests itself.

In practice, it is quite impossible to prevent reproduction in all the carriers of pathological genes and we are concerned here with the possibility of realizing these measures at the present time. Our success in reducing the number of hereditary blind will depend above all on the general education in the facts of heredity. The physicians and oculists, above all, should be acquainted with the necessary measures. It is only with their support, that we can hope to interest the authorities and the public.

Special emphasis must be placed upon consultation by persons contemplating marriage. The existing facilities for such consultations must be extended, and the public made to understand the importance of the information thus obtained.

Ordinarily, the blind gladly follow the advice given them. It should be relatively easy to make them understand the importance of not having children, by pointing out the social consequences, for these children, of becoming blind.

The author draws attention to the imperfections of the statistics. To improve them one ought to establish an international, unified classification, clearly to separate hereditary and non-hereditary cases, to have the patient examined by an oculist competent in genetics. The publications ought to be improved; the author agrees in this respect with the recommendations of Julia Bell (1933). The improvement of the statistics has more than a mere theoretical importance; it is of capital practical importance. It is only when good statistics are available that oculists will be able to make an exact prognosis for the diseased individual's offspring.

To prevent the transmission and appearance of hereditary eye diseases there must be a diminution of consanguineous marriages and procreation must be prevented in persons suffering from serious diseases and especially from serious dominant diseases: congenital cataract, aniridia, microphthalmia (dominant type), retinitis pigmentosa (dominant type), glioma, eventually congenital optic atrophy; in patients with sporadic dominant diseases, or non-dominant, when they have an affected child; in patients with concomitant hereditary diseases of other organs; in normal cases who have more than one child with hereditary eye disease (recommendation of the British Prevention of Blindness Committee). This case arises principally for the recessive diseases of which the more frequent are: buphthalmia, retinitis pigmentosa, total color blindness.

Procreation must also be prevented in the sisters of patients with sex-linked recessive diseases. It is principally to Leber's disease that this measure is applicable.

Abstention from parenthood is to be recommended in cases of serious recessive diseases. The difficulties are particularly great for the relatively frequent diseases like myopia. Despite the fact that myopia is the most frequent cause of hereditary blindness, the attempt to prevent its transmission would lead us too far afield. The only thing we can do at present is to advise a patient with high myopia not to marry a person similarly affected, for then 100 per cent of the children will be myopic.

The application of the measures to prevent the transmission of blindness may take place in various ways. In England, the blind may earn their living in the private institutions only so long as they remain celibate. Birth control, which is practised in England, also proposes to prevent the transmission of hereditary diseases by attempting to prevent the increase in the number of children in poor families, particularly where there is a danger the children may be deficient. It has also been suggested that the blind be segregated like the insane in order to prevent their reproduction. Such a practice, which would entail enormous expense, is inhuman, for the blind are of normal intelligence and morality.

Sterilization is undoubtedly the best method for preventing the transmission of hereditary blindness, particularly as the procedures of vasectomy and salpingectomy are now without danger. In certain countries, like Switzerland, Italy, etc., sterilization for eugenic reasons is not authorized. It is principally in these countries that a campaign in favor of voluntary sterilization must be organized.

It is obvious that sterilization is essential in the serious mental diseases. According to Park Lewis, 30 of the 48 United States have passed laws making sterilization compulsory for criminals and in certain mental diseases.

In Germany, the law of July 14, 1933, makes compulsory the sterilization of all individuals with serious diseases (congenital mental debility, depressive maniac psychosis, epilepsy, Huntington's chorea, hereditary deafness, hereditary blindness, serious malformations and alcoholism) . . . which, according to medical knowledge, have a great possibility of resulting in deficient offspring. This law does not apply to drug addicts, nor to apparently normal individuals with one or more children with manifestly hereditary diseases. All the cases are submitted for judgement to a sanitary council made of a judge, a government physician and a practising physician. The patient may appeal against the decision to a special court which has final jurisdiction. Wegner (1934) believes that 30 per cent of the cases of blindness may be prevented thanks to this law. There are, however, in the author's opinion, certain disadvantages to compulsory sterilization. The main one to be feared is that the patient, apprehensive of being declared to the competent authority, will see the physician as infrequently as possible, and will furnish him with an inexact history, thereby rendering the physician's task more difficult and preventing him from properly treating certain patients.

Let us summarize the measures susceptible in my opinion of diminishing the incidence of hereditary blindness:

(a) Collection of precise and complete statistics;

(b) Training of physicians (especially of ophthalmologists) in genetics, and education of authorities and public;

(c) Extension of facilities for pre-marital consultation, and the general introduction of the pre-marital certificate;

(d) Increased use of social workers;

(e) Decrease in consanguineous marriages;

(f) Decrease of the transmission of hereditary eye diseases by making sterilization available to the patients.

I propose that a committee should be named to study the means of realizing these different objectives. In working upon an international plan, this committee should be able to bring together the material which will permit judgement of the efficacy of the steps taken to decrease hereditary blindness in the various countries, and concrete recommendations to be made in the near future.

Discussion

Professor FLEISCHER (Germany). — I beg to be allowed to add a few remarks concerning possible protective measures against hereditary blindness. As you know and as mentioned by the speaker, Germany, by its July 14, 1933, Act of protection against hereditary diseases, has gone further than any other civilized country. This law provides — under specified conditions — for the sterilization of persons with hereditary diseases, and, among others, hereditary blindness. Sterilization may be ordered at the patient's request by "the tribunal for the health of the race" and this voluntary sterilization is the object one is aiming to obtain. But sterilization may also be compulsory. The law thus involves — in the interest of the community — a serious encroachment on the rights of the individual. The difficulties met with in the application of this Act are serious, especially with regard to diseases of the eye. I do not deny the aptness of Professor Franceschetti's remarks when he says in his report that from an apprehension of being notified, the patients will have recourse to the physician as rarely as possible and furnish him with an inexact history. In spite of this, these legal measures seem to me the only method susceptible of bringing about a marked decline of hereditary blindness. All the measures mentioned by Franceschetti and which imply the patient's consent (education, prematrimonial certificate, celibacy, segregation, voluntary sterilization) may yield results in some cases; they are, however, inadequate and they cannot be expected to bring about a notable diminution of hereditary blindness. Legal compulsion seems to be the only measure which is sufficiently drastic to be followed — indeed, not before some years have elapsed — by an appreciable decline in the number of the congenitally blind. One must hope, moreover, that thanks to more widespread popular education, compulsion will no longer be necessary and that voluntary sterilization will be the rule. Among the legal measures advocated by Franceschetti one must mention the interdiction of consanguineous marriages which is not yet applied in Germany.

It is significant that the German Act also provides for the compulsory notification of all cases of hereditary diseases. In this way an accurate estimate of the incidence of these diseases may be made and serve as a basis for preventive measures.

I think it is indispensable that this compulsory notification should be adopted in all countries in order to obtain an accurate picture of the frequency of hereditary diseases. Each country would then be free to decide whether legal measures ought to be adopted as the result of this enquiry.

THE CHAIRMAN mentioned to the Assembly the interesting lectures of Lt. Colonel Wright (of Madras) on "The Chief Preventable Blinding Diseases of Childhood." He quoted the following paragraph:

"It might seem at first sight that hereditary blinding diseases hardly come under the category of 'preventable,' but I hope to show later that they do. Some ten years ago I would not have included them amongst the chief preventable causes of blindness in children, but I am prepared to do so today. When for certain reasons it occurred to me last year that the hereditary blinding diseases might be so classified I began to collect a few facts in this connection. A survey of our hospital records, and a consideration of our experience with such diseases, convinced me that if we treat this group as a whole, we have a cause of blindness which is probably more important than any other single cause. In the first lecture of this series, I referred to my publication in the *Lancet* of April, 1931, in which a case was made out for keratomalacia as the greatest cause of preventable blindness in children in India. I now propose to suggest that the hereditary diseases taken as a collective group may be considered as filling this rôle, at all events, in South India . . .

"The total hereditary diseases recorded as such, average 91 per annum over a period of five years. This may be expressed as approximately 4.55 per 1,000 in our hospital population, whereas the figure for keratomalacia (total and practical blindness) was 3 per 1,000."

Mr. BICKERTON gave a summary of a paper he had previously published in the *British Medical Journal.* After reviewing the various aspects of hereditary blindness he suggested the following remedies:

1. Constructive birth control to avoid overcrowding and poverty.
2. Sterilization of mental defectives (and possibly certain criminals) as in America.
3. Review of the obsolete and ancient abortion laws, seventy years old. They are no longer effective, and are acting deleteriously and dysgenically. Abortion should act as a second line of defense to conception control, as in Russia.
4. Euthanasia for infants with gross defects to be available for parents who wish to make use of it.
5. Segregation of the mentally defective is difficult owing to the cost; some 300,000 are now at large.
6. The Catholics recommend control of marriage for the mentally defective, but this does not prevent illegitimacy.
7. The Wassermann reaction during or before pregnancy. This is done in Rumania before marriage.

Professor von SZILY (Germany). — In concluding this very important meeting, our distinguished chairman, Dr. Park Lewis, requests me — an honor which I highly appreciate — to express on behalf of the International Association for Prevention of Blindness, our most sincere thanks to the Royal Society of Medicine, of London, for its great kindness in receiving us in this famous House, full of the most inspiring historical recollections.